

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS

PATENT OF UNITED STATES IS:

- Recd JAI*
1. A semiconductor light-receiving device comprising:  
a first conductive type semiconductor substrate having a first surface on a light-receiving side and a second surface on the opposite side to said first surface;  
a first semiconductor layer formed on said first surface of said semiconductor substrate;  
a plurality of first conductive type second semiconductor layers reaching said semiconductor substrate from a surface of said first semiconductor layer, said second semiconductor layers being formed apart from each other;  
a second conductive type third semiconductor layer selectively formed on the surface of said first semiconductor layer, said third semiconductor layer surrounding each of said second semiconductor layers with said first semiconductor layer therebetween;  
a first electrode formed on said third semiconductor layer; and  
a second electrode formed on said second surface of said semiconductor substrate;  
wherein a region of said first semiconductor layer between each of said second semiconductor layers and said third semiconductor layer has a higher resistance than resistances of said second semiconductor layers and said third semiconductor layer.
2. The semiconductor light-receiving device according to claim 1, wherein said third semiconductor layer has a lattice form or a network form.
3. The semiconductor light-receiving device according to claim 2, wherein said first electrode has the lattice form or the network form and is provided on said third semiconductor layer.
4. The semiconductor light-receiving device according to claim 1, wherein said first electrode is formed on part of said third semiconductor layer.
5. The semiconductor light-receiving device according to claim 1, wherein each of said second semiconductor layers has an island form or a stripe form.

6. The semiconductor light-receiving device according to claim 1, wherein the region of said first semiconductor layer between said third semiconductor layer and each of said second semiconductor layers is completely depleted in a state in which a reverse bias is applied between said first electrode and said second electrode.

7. A semiconductor light-receiving device comprising:

a first conductive type semiconductor substrate having a first surface on a light-receiving side and a second surface on the opposite side to said first surface;

a first semiconductor layer formed on said first surface of said semiconductor substrate;

a plurality of first conductive type second semiconductor layers reaching said semiconductor substrate from a surface of said first semiconductor layer, said second semiconductor layers being formed apart from each other;

a second conductive type third semiconductor layer selectively formed on the surface of said first semiconductor layer and having a plurality of openings, each of said second semiconductor layers being provided within each of said openings of said third semiconductor layer respectively with said first semiconductor layer therebetween;

a first electrode formed on said third semiconductor layer; and

a second electrode formed on said second surface of said semiconductor substrate;

wherein a region of said first semiconductor layer between each of said second semiconductor layers and said third semiconductor layer has a higher resistance than resistances of said second semiconductor layers and said third semiconductor layer.

8. The semiconductor light-receiving device according to claim 7, wherein said first electrode has a lattice form or a network form and is provided on said third semiconductor layer.

9. The semiconductor light-receiving device according to claim 7, wherein said first electrode is formed on part of said third semiconductor layer.

10. The semiconductor light-receiving device according to claim 7, wherein each of said second semiconductor layers has an island form or a stripe form.

11. The semiconductor light-receiving device according to claim 7, wherein the region of said first semiconductor layer between said third semiconductor layer and each of said second semiconductor layers is completely depleted in a state in which a reverse bias is applied between said first electrode and said second electrode.

12. A semiconductor light-receiving device comprising:

a first conductive type semiconductor substrate having a first surface on a light-receiving side and a second surface on the opposite side to said first surface, said first surface including a plurality of protruded surface portions separated from each other;

a first semiconductor layer selectively formed on said first surface of said semiconductor substrate, said first semiconductor layer having a higher resistance than a resistance of said semiconductor substrate and having a plurality of openings, each of said protruded surface portions of said first surface being exposed within each of said openings of said first semiconductor layer respectively;

a second conductive type second semiconductor layer selectively formed on a surface of said first semiconductor layer and surrounding each of said protruded surface portions of said first surface with said first semiconductor layer therebetween;

a first electrode formed on said second semiconductor layer; and

a second electrode formed on said second surface of said semiconductor substrate.

13. The semiconductor light-receiving device according to claim 12, wherein said second semiconductor layer has a lattice form or a network form.

14. The semiconductor light-receiving device according to claim 13, wherein said first electrode has the lattice form or the network form and is provided on said second semiconductor layer.

15. The semiconductor light-receiving device according to claim 12, wherein said first electrode is formed on part of said second semiconductor layer.

16. The semiconductor light-receiving device according to claim 12, wherein each of said protruded surface portions of said semiconductor substrate has an island form or a stripe

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form.

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*Ref B*  
17. The semiconductor light-receiving device according to claim 12, wherein a region of said first semiconductor layer between said second semiconductor layer and each of said protruded surface portions of said semiconductor substrate is completely depleted in a state in which a reverse bias is applied between said first electrode and said second electrode.

18. A semiconductor light-receiving device comprising:

a first conductive type semiconductor substrate having a first surface on a light-receiving side and a second surface on the opposite side to said first surface, said first surface including a plurality of protruded surface portions separated from each other;

a first semiconductor layer selectively formed on said first surface of said semiconductor substrate, said first semiconductor layer having a higher resistance than a resistance of said semiconductor substrate and having a plurality of openings, each of said protruded surface portions of said first surface being exposed within each of said openings of said first semiconductor layer respectively;

a second conductive type second semiconductor layer selectively formed on a surface of said first semiconductor layer and having a plurality of openings, each of said protruded surface portions of said first surface being provided within each of said openings of said second semiconductor layer respectively with said first semiconductor layer therebetween;

a first electrode formed on said second semiconductor layer; and

a second electrode formed on said second surface of said semiconductor substrate.

19. The semiconductor light-receiving device according to claim 18, wherein said first electrode has a lattice form or a network form and is provided on said second semiconductor layer.

20. The semiconductor light-receiving device according to claim 18, wherein said first electrode is formed on part of said second semiconductor layer.

21. The semiconductor light-receiving device according to claim 18, wherein each of said protruded surface portions of said semiconductor substrate has an island form or a stripe

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form.

22. The semiconductor light-receiving device according to claim 18, wherein a region of said first semiconductor layer between said second semiconductor layer and each of said protruded surface portions of said semiconductor substrate is completely depleted in a state in which a reverse bias is applied between said first electrode and said second electrode.